



J R C T E C H N I C A L R E P O R T S

Fire Monitoring Tool

ACP Fire Monitoring Tool for protected area management

Ilaria Palumbo, Jean-Marie Grégoire, Bart Verbeeck and Stephen Peedell

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Contact information
Ilaria Palumbo, Jean-Marie Grégoire, Bart Verbeeck and Stephen Peedell
Address: Joint Research Centre, Via Enrico Fermi 2749, TP 440, 21027 Ispra (VA), Italy
E-mail:
ilaria.palumbo@ext.jrc.ec.europa.eu
jean-marie.gregoire@jrc.ec.europa.eu
bart.verbeeck@jrc.ec.europa.eu
stephen.peedell@jrc.ec.europa.eu
Tel : +39 0332 789269
Fax : +39 0332-789960
<http://estation.jrc.ec.europa.eu/content/who-are-we>
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Table of contents

Context	1
Why a Web Tool for Fire Monitoring?	2
Who is it for?	2
Tool Description	3

A Fire Monitoring Tool for Protected Area Management

Context

Globally, between 3.5 and 4.5 millions Km² of the land surface burn every year, particularly in the tropical regions, and Africa alone accounts for more than half of that total.

Besides the negative effects on landscape, human health and safety, fire has also an important ecological role, since it is essential for the well-being of many ecosystems and many populations of the tropical regions use it as a land management tool.

For this reason park managers often use fire to maintain and promote a variety of healthy natural habitats and high levels of biodiversity in their protected areas. For example, fire is used to regenerate palatable grass for herbivores, and to control bush encroachment and invasive species. It is also used as a protection against unwanted fires started outside the protected area. Therefore, the successful implementation of conservation programs in the tropical regions, and more specifically in the African, Caribbean and Pacific (ACP) countries, which are a focus of EU Development Assistance, depends to a significant extent on the availability and understanding of fire as an ecological process.

To give support to these conservation activities, our team has developed a fire monitoring system that can be used for the design, implementation and assessment of fire management plans in and around protected areas. This system functions at the global level.

The European Commission Joint Research Centre (JRC), provides scientific and technical support to the Directorate General Development and Cooperation – EuropeAid (DG DEVCO) in its activities designing EU development policies and delivering aid through programmes and projects across the world, and in particular in developing cooperation with African, Caribbean and Pacific (ACP). During the last three decades, research at the JRC has addressed several themes relevant to the ACP countries. These themes include the environmental status (land degradation and desertification, biodiversity, and climate change), the condition of natural resources (water, forestry, rangeland and agriculture), natural hazards (fires, droughts and floods), renewable energies (photovoltaics), humanitarian assistance (crisis

management), early warning systems (conflict and natural disasters) and trade (forest and agriculture products, biofuels, export subsidies, non-tariff trade barriers and trade balances). JRC's research addresses these themes through the development of databases documenting physical, environmental and socioeconomic variables, complemented by modeling, dedicated geographic information systems and near-real time information from Earth Observing satellites.

Why a Web Tool for Fire Monitoring?

Park managers need up-to-date information on fire occurrence for their daily activities and longer-term planning. Nowadays Earth Observation (EO) provides reliable data on fire activity worldwide, however satellite data require processing and analysis capacity, which are not always accessible to park managers. In order to overcome this limitation we developed a fire monitoring system based on EO that presents information in the form of environmental indicators and maps that do not require specific software or further processing.

The tool provides near-real time data and covers more than ten years from late 2000 to the present day, at global level. This information, available on-line, can assist park managers in their conservation programs, the design and implementation of fire plans, and the control of human induced threats and pressures. Moreover the distribution of the data and indicators through the internet allows to reach many users and give them access to data and maps systematically, in near-real time. The availability of a long time series of fire data allows the detection of alterations of the fire regimes in the natural habitats. In forest ecosystems, for example, fire occurrence can be used as a proxy for park effectiveness.

Who is it for?

This fire monitoring tool has been specifically designed for people working in protected areas. It aims at supporting park managers and scientists in their conservation programs, decision-making activities, as well as the prevention, plan and control of fire. In fire dependent or influenced ecosystems, the Fire Monitoring Tool provides park managers with up to date information on burning patterns in and around their area of interest. They can, on the basis of these patterns, detect any anomaly in the implementation of the fire management plans. Anomalies can be indicators of illegal

activities, such as poaching or grazing inside the parks, or simply show if fire management plans are addressing their objectives effectively. The Fire Monitoring Tool gives the managers the possibility to improve their planning and management of prescribed burning and to react more effectively to illegal activities.

In fire-sensitive ecosystems, such as the tropical moist forests, the tool provides park managers a rapid and systematic way to detect human induced threats and supports the patrolling activities in and around the protected areas.

The system provides more than a decade of fire data for each park. This helps scientists to improve their understanding of fire ecology in protected areas and the spatio-temporal trends or changes. Anomalies in fire regime (e.g. change in fire frequency, seasonality) can be either an indicator of land cover change or habitat loss, or more generally an indicator of land use change. The possibility to access this information is therefore important to take the appropriate decisions for effective conservation.

More generally, the fire monitoring tool provides decision makers, at local, national and regional levels, with updated information which can be used to identify priority areas, strengthen conservation programs and improve fund allocation.

Tool Description

The tool uses web services developed at the JRC to provide historical and near-real time information of the fire activity derived from the satellite-borne Moderate Resolution Imaging Spectro-radiometer (MODIS) fire products. These are distributed by NASA-FIRMS and the University of Maryland and cover more than a decade going from late 2000 to present. The tool includes all the protected areas listed in the World Database on Protected Areas (United Nations Environment Programme, World Conservation Monitoring Centre - UNEP-WCMC).

The MODIS fire products consist of two types of datasets: the active fire and burned area. The active fire product provides information on the fire occurrence (timing and location of fire) and is available 48 hours after the satellite overpass, while burnt area data require longer processing time and are available 2-3 months after the satellite observation (figure 1).

Once a country and a protected area are selected, the user can retrieve, on-the-fly, graphs, tables and maps of the burning activity, for a given period of time (figure 2). The system shows the fire activity through two key parameters: the fire occurrence and the area burned by land cover type. These parameters are computed for each park and

the 25-km buffer around it. For each selected protected area, the system shows, by default, the start/end of the latest complete fire season, as well as the average fire season, using the whole time-series available (2003-present). The user can select any season using a time bar.

Graphical synthesis of fire activity, as the cumulative fire counts and burned area, are provided for the selected fire season and against the average values over the whole time-series 2003-present. Monthly maps of the active fires, burned areas and fire density are also available and can be downloaded in different standard formats for geospatial data – as raster (geotiff) or vector (shapefile).

No additional software is required to visualize or use the data. For basic users, the content can be explored in excel tables: they report the location of the fires (latitude, longitude), the date, time and intensity of burning; whereas more advanced users can open the maps using a Geographic Information System (GIS) tool.

The fire monitoring tool is accessible at the following address:

<http://acpobservatory.jrc.ec.europa.eu/content/fire-monitoring>

Future developments will include an interactive map viewer to visualize fire occurrence and burned area in a GIS-style interface, for any period of time from late 2000 to present. Statistics on fire activity will not be restricted to protected areas but extended to administrative units at national and regional levels.

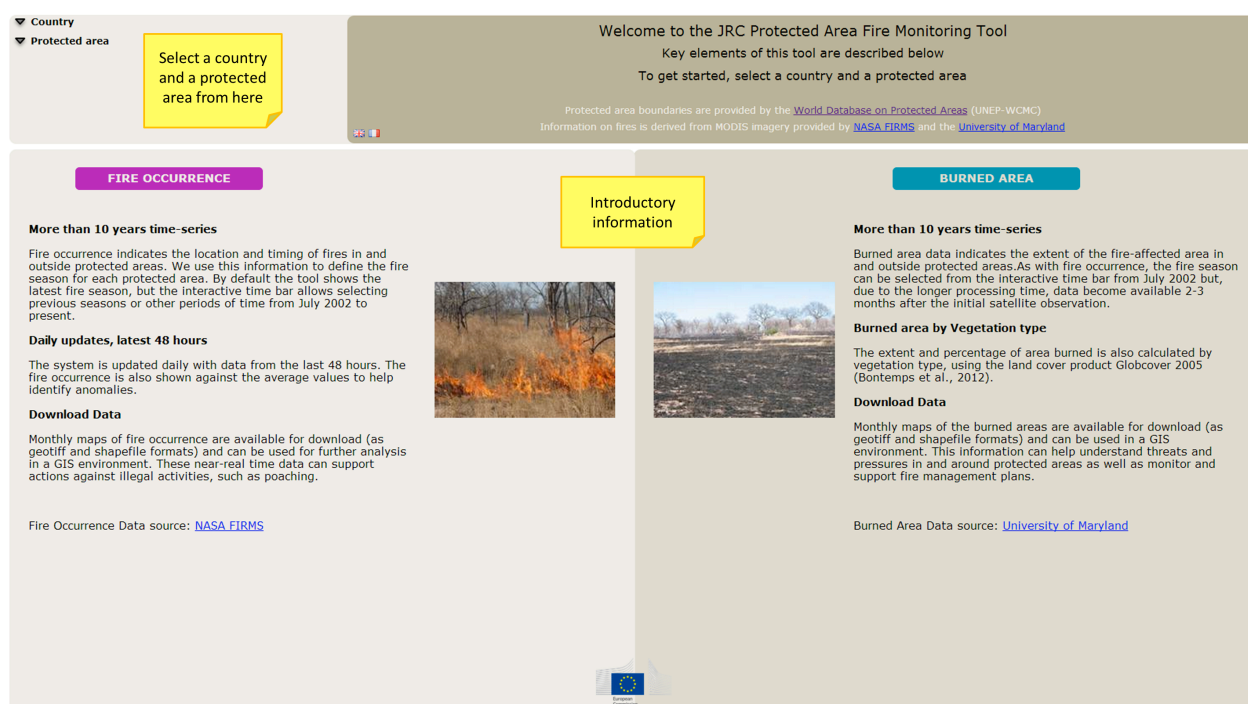


Figure 1. The Welcome page of the Fire Tool.



Figure 2. The fire indicators displayed in the Fire Tool.

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Author(s): Ilaria Palumbo, Jean-Marie Grégoire, Bart Verbeeck and Stephen Peedell

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Abstract

This report documents the context and the objectives of a new Fire Monitoring Tool developed in the framework of the JRC activity in African, Caribbean and Pacific (ACP) Countries.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.



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